The varying distance between plane PP' and plane HH' measured in plane DD' is $O'A'=OO'$ tan d. But $OO'=R$ sin L, $\therefore$ $O'A'=R$ sin L tan d, but as d may be plus or minus, tan d will take the same sign, and

$O'A'=\pm R$ sin L tan d ..... (2)

Angle $AO'B=D''O'B\pm$ angle $D''O'A$.

Diameter of circle on plane $DD'=R$ cos L.

Sin $D''O'B=(B'A'\pm A'O')/R$ cos $L=[(R$ sin $T/\cos d)\pm R$ sin L tan $d]/R$ cos $L=(\sin T/\cos L$ cos $d)\pm\tan L$ tan d (3)

Sin $D''O'A=O'A'/R$ cos $L=\pm(R$ sin L tan d/R cos $L)$ $=\pm\tan L$ tan d ..... (4)

When $d=O$, angle $D''O'A=O$, and angle $D''O'B=$angle $AO'B$.

Sin $AO'B=\sin T/\cos L$ ..... (5)

When $L=O$, $AO'B=D''O'B$; and from (2), sin $AO'B=\sin T/\cos d$ ..... (6)

Figs. 2 and 3 are constructed from figures obtained by dividing the various values of angle $AO'B$ expressed in degrees by 15 (the number of degrees the earth revolves in one hour).

HAMILTON BRIDGE TO COST OVER MILLION DOLLARS

INSTRUCTED on August 7th, 1918, to prepare a report and estimate on the cost and advisability of the construction of a bridge at the western entrance to the city of Hamilton, to complete the Toronto-Hamilton highway, E. R. Gray, city engineer of Hamilton, submitted the completed document last week. It estimates the cost of a high level concrete structure at $1,419,100, exclusive of land to be acquired. A steel bridge is estimated at $1,226,590.

Of four proposals that were considered, the city engineer supports what is known as the "Mackay plan." This proposes "a diversion of the highway northerly at a point about a quarter mile east of the Valley Inn ravine, paralleling the present road and crossing the ravine approximately on a line of the present highway by a high level bridge, carrying the roadway over the G.T.R. to a point on an unopened road allowance on the western bank of the ravine."

The Route

It is then proposed to pass southerly along this road, to cross the Junction cut and Guelph branch by small structures, with a junction at York St. to be obtained on the present high level roadway a short distance southwest of the existing wooden bridge over the Brantford line.

This scheme also provides for the entrance of a proposed highway from Owen Sound to Guelph to join the Toronto-Hamilton highway at the point of intersection of the Toronto-Hamilton highway with the unopened road allowance.

Length 1,300 Ft.

In designating a concrete structure, Mr. Gray determines the length over the Valley Inn ravine at 1,300 ft. A center span of 416 ft. and other spans of 156 ft. each are provided for, the roadway standing approximately 87 ft. above the water of the harbor.

The width of the bridge, both for concrete and steel is assumed the same, viz., roadway 40 ft., flanked by two concrete walks each 6 ft.

Steel Design

The steel bridge is estimated to cost $1,226,590. The report points out that the yearly charges for interest and sinking fund, based on the cost figures, would be as follows: Concrete structure, $88,494; steel structure, $77,869.

Newman Urb, capitalist, of New York City, has acquired control of the lease of the Prince Rupert Dry Dock and Engineering Co., by buying out the interest of John Mullen, contractor, of Pittsburg. Mr. Urb states that he has opened negotiations for a contract to build 20 large oil tank steamers.

DEAN MITCHELL'S ADDRESS TO TEACHERS

IN addressing the college and secondary school department of the Ontario Educational Association last week, Brig.-Gen. C. H. Mitchell, dean of the Faculty of Applied Science and Engineering, University of Toronto, stated that the call for men and means with which to carry out the work of the country, wherein applied science and engineering knowledge and ability are required, is both insistent and universal throughout the Dominion.

"Those engaged in the work of education are vitally interested in the situation," the dean assured. "It now appears that a special effort should be exerted to direct the proper type of students into these professions."

No Overcrowding

Fear that various branches of the engineering profession may become overcrowded need not be seriously considered. The fear is rather that the present small monetary attraction in certain purely professional directions may, unfortunately, deter promising young men, and that in spite of their good education and the country's demand, they may drift from professional occupations.

Special mention was accorded the "practically indispensable" branch of engineering research, and also the administrative branch, lying between professional engineering and the business side of projects or works connected with both.

Our Place as a Nation

"Nearly all these professions perform vital functions in relation to the country's development," the dean pointed out. "And they require special knowledge, ability and service. Utilization of our natural resources to the best advantage, the best application of our industries, and the constant research and effort we can make to improve our material position, are all of the highest importance to us in securing and maintaining our place as a nation."

"Leader" Type of Students

To anticipate the growing demand for applied science education, rather than wait and see how great it will be, was the policy advocated by Dean Mitchell, who sketched the necessary qualifications for students pursuing an applied science course leading to the engineering professions. Briefly, each one should have an energetic but studious temperament of the "leader" type, with well-developed powers of observation, a fondness for mathematics, and constructive ability.

Such English!

"On my return from five years at the war, much of it amongst the various languages of Europe, I was shocked," declared the dean, "at the loose, ungrammatical, slangy and extravagant English I heard not only on the streets of Toronto, but about the precincts of the university. Let me make a plea for better English spoken and written in all our schools."

John Murphy, electrical engineer of the Department of Railways and Canals, Ottawa, addressed the Peterborough Branch of the Engineering Institute last Thursday evening, on the formation of frazil and anchor ice. In discussing the small amount of heat that is required to keep water which is near the freezing point from forming ice, Mr. Murphy described a case that occurred on a small river near Dixon, Ill., where the condensing water from a cement mill, which was at a temperature of 50 degs. F., discharged into the stream, and was proven to have prevented the formation of surface ice for a distance of two miles down-stream during five successive winters. This interfered with the harvesting operations of an ice company, and in the litigation that followed, it was shown that the condensing water, amounting to about 8 sec. ft., had prevented the formation of ice in a river which had a flow of approximately 4,000 sec. ft.